

## THE X-RAY FINDINGS IN A CASE OF GRITTI-STOKES AMPUTATION.<sup>1</sup>

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I AM not aware that there has been any X-ray study of the results obtained in the Gritti-Stokes amputation, with any definite information as to the ultimate relationship between the sawed patella and the lower end of the femur. Gritti's original object was to give a good bony cap to the lower end of the femur, forming a symmetrically rounded stump, well adapted to stand pressure and support an artificial limb. Gritti's original operation was a transcondyloid amputation. This was modified by Sir William Stokes to a supracondyloid amputation. He argued, and quite correctly, I think, that the transcondyloid amputation did not allow the sawed surface of the patella to be applied to the sawed femur without strain on the patella and the tendon of the quadriceps, and that contact could not be maintained without a forced adjustment, aided by pegging or nailing the bones together. If, however, the section was made a half-inch or more above the condyles, the patella could easily be applied to the sawed surface of the femur without strain and with sufficient play in the tendon of the quadriceps to overcome the contractions of this powerful muscle.

Now I believe that after the healing of the stump it may be quite difficult, if not impossible, to determine without the X-ray the exact result as to bony union between the two bones. A mere fibrous union where the stump is covered by the dense and strong fascia in this region will hold the parts so firmly together as to make any separate movements of the bones quite impossible and give the impression of osseous union. Certainly in my own case which I present here, though exam-

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Rotation of patella to femur following Griggs-Stokes amputation. Profile view—patella tilted out like the half-open lid of a box.



Frontal view—patella drawn 2½ centimetres inward.

ined so soon after operation the parts seemed firmly united and gave me the impression that the patella was in place and that I should ultimately have osseous union between the two bones. The X-ray, however, showed me a quite different result.

The case in point was briefly this: A man of 62 years came to me with a carious right tibia, the result of a gun-shot injury to his leg in the battle of Fredericksburg, 41 years before. All that time he had dragged the leg about, always getting worse, until finally in despair he realized the necessity of an amputation. At operation the whole tibia was found to be diseased, and I made a supracondyloid amputation with a long anterior flap, applying the sawed under-surface of the patella to the sawed femur. There was no strain on the tendon of the quadriceps, and the sawed surfaces were easily brought in contact and held by a snug sewing of the fascia and tendons with chromicized gut. The stump healed in two weeks without pus. This operation gives a beautiful, symmetrical stump, with the line of union of the flaps posterior, and looking as though "born that way."

Now my X-ray shows that I failed to hold the patella in place, and that through the strong action of the powerful thigh muscle, it had been drawn two and a-half centimetres inwards, and in addition had been tilted up like the half-open lid of a box, producing the very results that Stokes had tried to overcome by his supracondyloid modification. Judging from the skiagraph I have not got a very symmetrical stump, but the external appearances do not show this displacement; the stump looks symmetrical and firm. Though the skiagraph was taken just before the patient left the hospital, too soon for complete bony union had the bones held their position, we can see at any rate the displacement of the patella through the strong action of the quadriceps femoris, and know positively that no bony union is possible.

The X-ray findings in this case have suggested to me the following points for consideration:

Is it desirable to get a bony union between the patella and femur if we have otherwise a symmetrical, well-shaped stump?

I am inclined to believe that a fibrous union with the patella well in place and acting as a sort of buffer is preferable to a bony union where it forms a mere bony knob to the femur. I cannot but believe, too, that unless the patella is held in place by nail or peg, a mere fibrous union is the rule and the osseous union the rare exception. With this belief and knowing the excellent results following this amputation, I should discard all radical efforts to obtain bony union. Really the retention of the patella in the anterior flap is desirable quite aside from its forming a bony cap to the end of the femur. It gives a body to the flap, which, with the strong fascia of the knee, aids in forming an admirable cover to the end of the femur and in the making of a symmetrical stump. Compare this flap with the ordinary skin-flap of the Cardan operation and its superiority becomes at once apparent.

Our efforts should be more towards keeping the patella in the midline than towards obtaining bony union. Kept in the midline, it acts as a buffer to the end of the femur, as well as a good bony pad to a stump in every way adapted to hold the artificial limb and to bear the weight of the body.

This operation has several good points to recommend it. The section is through a spongy bone which heals rapidly, and the medullary canal is not opened. The avoidance of the femoral muscles in cutting out the posterior flap, the tendons alone being cut which retract and obviate any further retraction of the tissues in the healing of the stump. And, finally, there are fewer vessels cut, the popliteal and some articular branches alone requiring ligature.